Software Product Description

PRODUCT NAME: VMS Volume Shadowing, Version 5.4 **SPD 27.29.07**

DESCRIPTION

VMS Volume Shadowing is a System Integrated Product (SIP) available on VMS systems. VMS Volume Shadowing provides high data availability by ensuring against data loss resulting from media deterioration or through controller or device failure. This prevents storage subsystem component failures from interrupting system or application operation.

Volume shadowing maintains multiple redundant copies of data on a collection of disks called a shadow set. Shadow sets consist of one, two, or three compatible disk volumes which are referred to as shadow set members. This duplication of data provides greater data availability. When data is recorded on more than one disk volume, the data is accessible even when one volume is unavailable. Disk input/output operations continue transparently with the remaining members of the shadow set.

Because a shadow set is made up of multiple disks containing the same data, the VMS Volume Shadowing software can read from either disk device. The VMS Volume Shadowing software determines which disk to read from, per read operation.

If sections of a volume become unreadable, systems with volume shadowing can read the data from the duplicate and attempt to repair the original by writing the data to good blocks.

VMS system disks and any Files-11 On-Disk Structure 2 (ODS2) data disks can be volume shadowed.

For the purposes of this document, the term CPU is used to refer to a single VAX computer. A CPU may be standalone or a member of a VAXcluster.

VMS Volume Shadowing provides two modes of performing shadowing operations on the VMS Operating System:

- VAX Volume Shadowing Phase I

  This is the original implementation of the VAX Volume Shadowing product. Phase I VMS Volume Shadowing provides for centralized shadowing on VMS systems using Hierarchical Storage Controllers (HSC). This mode of shadowing is limited to disks connected to HSCs, either in a VAXcluster or single CPU.

- VMS Volume Shadowing Phase II

  Phase II allows shadowing on the same configurations as Phase I plus it supports VAXcluster wide shadowing of disks on a single CPU or located anywhere in a VAXcluster system.

  VMS Volume Shadowing Phase II supports VAXcluster wide shadowing of all Digital Storage Architecture (DSA) devices. Phase II is not limited to HSC-controlled disks, but extends volume shadowing capabilities to all DSA disks including those on local adapters, all Digital Small Systems Interconenct (the DSSI RF series) disk devices on any VAX computer, and VMS MSCP served disks located anywhere in any supported VAXcluster configuration.

It is possible to use both modes of shadowing on the same CPU or VAXcluster system at the same time. Any given shadow set must be either Phase I or Phase II; a shadow set cannot be a mixture of the two modes of shadowing.

Characteristics

CPUs and Controllers

VMS Volume Shadowing requires a minimum of one VAX CPU, one MSCP- compliant mass storage controller, and one Digital Storage Architecture (DSA) disk drive and volume. Although only one disk is required, there must be two or more disk drives and volumes in order to "shadow" or maintain multiple copies of the same data. This configuration provides protection against either failure of a single disk drive or deterioration of a single volume.

Using two controllers provides a further guarantee of data availability in the event of a single controller failure. Using a VAXcluster and multiple controllers provides the greatest data availability.

Shadow Set Membership

A shadow set can have one, two, or three members. The ability to have a shadow set with only a single member allows a two-member shadow set to continue operation after the failure of one member. It also allows a second member to be added at any time with no disruption of the application.

All members of a shadow set must be of the same disk type, for example, all RA90s or RF31s. See the *Supported Hardware Devices* section for a list of those disk devices supported in shadow sets.

Transparency to the End User

The shadow set acts as a single disk. The user makes no effort to have the data propagated to all of the members of a shadow set. It is a task of the volume shadowing software to replicate the data on all shadow set members.

VMS Volume Shadowing is invisible to application programs and users. All commands and program language features that address data on non-shadowed disks may be used to address data on shadowed disks with no changes.

Individual disks may be added to or removed from the shadow set without affecting either the end user or any application.

Shadow Set Operation

A disk can be removed from the shadow set by operator command or automatically. A failed disk is removed from the shadow set automatically; no operator intervention is required.

A disk is only added to the shadow set on command. Within a reasonable period of time, the newly added shadow set member is made identical to the other member(s). Full read/write access to the shadow set continues while the new member is being added.

System Disk Shadow Sets

System disk(s), like any other Files-11 ODS2 disks, can be shadowed.

Restrictions

A quorum disk cannot be shadowed in a VAXcluster system.

Disks cannot have hardware write protection enabled. Hardware write protection stops volume shadowing software from maintaining identical volumes.

In a VAXcluster with more than one Star Coupler, Phase I shadowing is limited by the following restrictions:

- If a VAX is to directly access a Phase I shadow set on an HSC, the VAX must have a direct CI path to that HSC (be connected to the same Star Coupler).
- Phase I shadow sets may be MSCP served over the CI. To do this, the VAXs must be on the same Star Coupler as the HSC(s) with the shadow set. These VAXs can then MSCP serve the shadow set to other VAXs connected to other Star Couplers. If a VAX is accessing a Phase I shadow set via another VAX's MSCP Server, it cannot directly access any Phase I shadow set on any local HSC. Essentially, a CPU must access all its Phase I shadow sets either locally or via a served path. It cannot do both.
- VAXs accessing Phase I shadow sets via an MSCP served path (over the CI or Ethernet) cannot add or remove members of the shadow set, they have data access only.
- Phase II shadow sets are not subject to any of the above restrictions involving multiple star couplers.

Phase I supports a maximum of 16 shadowed disks per HSC or HSC pair (for dual pathed disks).

Phase I supports a maximum of 8 shadow sets per HSC or HSC pair (for dual pathed disks).

For additional information about restrictions, refer to the VMS Operating System Software Product Description (SPD 25.01.xx) and the VAXcluster Software Product Description (SPD 29.78.xx).

HARDWARE REQUIREMENTS - PHASE I

Refer to the VMS Operating System Software Product Description (SPD 25.01.xx) and VAXcluster Software Product Description (SPD 29.78.xx) for information about hardware requirements and supported CPUs.

At least one HSC series controller is required.

Shadow sets must be made of identical types of disks (for example, all RA90s) connected to the same HSC. If the disks are dual pathed between two HSCs, all members of the shadow set must be dual pathed between the same pair of HSCs, and both HSCs must be connected to the same Star Coupler.

HARDWARE REQUIREMENTS - PHASE II

VMS Volume Shadowing Phase II does not depend on specific hardware in order to operate. All shadowing functions can be performed on any supported VAX CPU by the VMS Operating System. Shadowing capabilities are supported on all disks and controllers listed in the *Supported Hardware Devices* section of this SPD.

All members of a shadow set must be the same type of disk (for example, all RA90s or all RF71s). Members of a shadow set may be located on a single CPU or anywhere in a VAXcluster. There are no requirements on the location of shadow set members beyond the valid disk configurations defined in the VMS Operating System Software Product Description (SPD 25.01.xx) and VAXcluster Software Product Description (SPD 29.78.xx).

Supported Hardware Devices

VMS Volume Shadowing supports the following devices and controllers for both Phase I and Phase II shadowing, unless otherwise specified. These devices may be components of Storage Array (SAxxx) products.

Disk Controllers and Adaptors

All HSCs supported by the VMS Operating System

Controllers Supported by Phase II Shadowing Only:

- KDA50
- KDB50
- KDM70
- KFQSA
- RQDX3
- RQDX2
- UDA50

Disks Supported by Volume Shadowing:

- RA60
- RA70
- RA80
- RA81
- RA82
- RA90
- RA92
- ESE20
- RF30 (Phase II only)
- RF31 (Phase II only)
- RF71 (Phase II only)
- RD51 when connected to RQDX controller (Phase II only)
- RD52 when connected to RQDX controller (Phase II only)
- RD53 when connected to RQDX controller (Phase II only)
- RD54 when connected to RQDX controller (Phase II only)

CLUSTER ENVIRONMENT

PHASE I and PHASE II

VMS Volume Shadowing is fully supported when installed on any valid and licensed VAXcluster configuration without restrictions. The *HARDWARE REQUIREMENTS* section of this product's Software Product Description and the VMS Operating System Software Product Description (SPD 25.01.xx) list any special hardware required by this product.

VAXcluster configurations are fully described in the VAXcluster Software Product Description (SPD 29.78.xx).

If VMS V5.3 and V5.4 are both present in a VAXcluster, members of the VAXcluster that are running VMS V5.3 can only access Phase I shadow sets. Members of the VAXcluster running VMS V5.4 can access either Phase I or Phase II shadow sets.

SOFTWARE REQUIREMENTS

PHASE I and PHASE II

- VMS Operating System V5.4
- HSC Software V3.9

Refer to the VAXcluster Software Product Description (SPD 29.78.xx) for information about rolling upgrade restrictions.

VMS Tailoring

PHASE I and PHASE II

For VMS V5.x, the following VMS class is required for full functionality of this layered product.

- VMS Required Saveset

For more information about VMS classes and tailoring, refer to the VMS Operating System Software Product Description (SPD 25.01.xx).

OPTIONAL SOFTWARE

None

GROWTH CONSIDERATIONS

The minimum hardware/software requirements for any future version of this product may be different from the requirements for the current version.

ORDERING INFORMATION

Software Licenses: QL-AB2A*-**
Software Documentation: QA-AB2AA-GZ
Software Product Services: QT-AB2A*-**

* Denotes variant fields. For additional information on available licenses, services and media, refer to the appropriate price book.

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LICENSE MANAGEMENT FACILITY

VMS Volume Shadowing supports the VMS License Management Facility (LMF).

License units for this product are allocated on a CPU-capacity basis.

Every CPU in a VAXcluster that mounts a shadow set must have a VMS Volume Shadowing License installed.

For more information about the License Management Facility, refer to the VMS Operating System Software Product Description (SPD 25.01.xx) or the License Management Utility Manual of the VMS Operating System documentation set.

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